POWER WALKER

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority from U.S. Provisional Application Serial No. 60/393,450, titled POWER WALKER, filed by William T. Wilkinson on July 3, 2002, incorporated herein by reference.

FIELD OF THE INVENTION

This invention relates to exercise devices. More particularly, it relates to devices that can be worn around the torso of a user for providing an upper body workout while engaging in a lower body exercise such as walking or running.

BACKGROUND OF THE INVENTION

Many people exercise to improve their physical fitness and health, often by running, jogging, skating, or performing some other lower body intensive activity. Although these lower body intensive activities improve cardiovascular fitness and exercise the lower body, however, they do not provide substantial exercise for the upper body. Furthermore, any equipment to be used during any of these lower body intensive activities must be easily portable because the user is moving from place to place during these activities.

Alternatively, some individuals use stationary exercise machines, some of which afford an upper body as well as a lower body workout. Among the most popular stationary exercise machines are aerobic leg exercise machines such as treadmills, air walkers, upright and recumbent bicycle machines, steppers, elliptical exercise machines, cross-country and downhill ski machines, trampolines, squat machines, rowing machines, and the like. These suffer the disadvantage of substantial expense, size, and lack of portability, however, making them inconvenient to move and store.

In addition, the upper body or arm motion provided by such machines is typically an unnatural motion, requiring the user to push forward and/or pull rearward. For example, certain cross-country ski machines, such as NordicTrack® exercise machines, have a cable or reel system for the arms that is mounted in front of the user. The front-mounted arm system produces an awkward, pull-down motion on the back swing of the arms. This causes the body to lean so uncomfortably forward that a separate structure is typically provided as a stomach/mid-section support.

Additionally, arm-exercise mechanisms on many existing machines typically require the user's arms to be raised above the waist during the entire push/pull cycle. The poles or exercise arms on such machines are generally mounted in a fixed position, in front of the user, often making the user lean forward, straining the lower back and neck, rather than being in a more comfortable, upright posture position. Additionally, the poles or exercise arms typically travel in a fixed arc, thus limiting the range of motion of the arms and upper body to a predetermined distance traveled and to a single plane of motion that is unnatural.

Many known torso-mounted exercise devices provide resistance forces that are directed from the waist, thereby encouraging an unnatural and uncomfortable arm motion requiring the arm to be lifted as opposed to hanging naturally below the waist. When engaged in running, jogging, skating or other lower body intensive activity, the arms and the hands typically extend through a range of motion that varies in height and direction. Other existing devices employ a single cord with handles at both ends so that forward movement of one hand pulls the other handle rearwards, and vice versa. This typically requires that the motions of the right and left hands be synchronized, however, which may not always be desirable. Still other known torso-mounted devices position the source of resistance so that the resistance is engaged on the user's upswing at a position that is not at the beginning of the forward swing of the user's arm. Thus, the user does not get the benefit of the resistance over the entire arm swing.

Therefore, there continues to be a need for a portable exercise device capable of exercising arms through a full, natural range of motion while the wearer is engaged in a lower body intensive exercise such as walking or running.

SUMMARY OF THE INVENTION

According to one aspect of the invention, there is provided an exercise device wearable by a human user, comprising a mounting element, such as a belt, adapted to be secured to a torso of the user; one or more resistance units connected to the mounting element, each resistance unit having at least one cord attached thereto at a first end of the cord, and an engagement interface at a second end of each cord; and at least one cord-positioning structure. The cord-positioning structure comprises a shaft having a point of attachment to the mounting element and having one or more cord guides, for example one or more pulleys, connected thereto. Each cord-

positioning structure is adapted to provide the one or more cord guides in a position located rearward of the user, downward relative to a waist level of the user, and, optionally, outward relative to a spine of the user. The device is adapted to provide resistance to a full, natural forward arm swing of the user. In one embodiment, the engagement interface is adapted to engage or be engaged by an arm or hand of the user and the resistance unit is mounted on the mounting unit. In another embodiment, the resistance unit is adapted to engage or be engaged by an arm or hand of the user and the engagement interface is mounted to the mounting unit, the cord-positioning structure, or one of the cord guides.

The position of the cord guides may be adjustable, such as at the point of attachment to the mounting element. For example, the device may comprise a hinge at the point of attachment of each shaft to the mounting element that allows pivotable adjustment of each shaft. In such an embodiment, the hinge may be further adapted to allow positioning of the shaft into a substantially vertical position when the device is not in use. The position of the guide may also or additionally be adjustable via axial adjustment of a portion of the cord-positioning structure.

The cord-positioning structure may comprise a resilient member, such as a resilient member that engages the mounting element at the point of attachment. In one embodiment, each resistance unit provides frictional resistance, such as wherein each resistance unit comprises a reel. The cord may be inelastic or elastic.

One embodiment comprises a single cord-positioning structure, for example, comprising a crosspiece attached to and substantially perpendicular to the shaft. The crosspiece has a left end with a left cord guides attached thereto and a right end with a right cord guides attached thereto. One or both of the length and the width of the cord-positioning structure may be adjustable.

The resistance unit may comprise a single reel mounted to the mounting element, or two reels mounted to the mounting element, each reel having a cord with an engagement interface adapted for engagement by one of the user's arm or hands. The resistant units may be permanently attached to the mounting structure, or removable.

In another aspect of the invention, there is provided a method of exercising comprising providing an exercise device wearable by a human user comprising a mounting element adapted to be secured to a torso of the user; one or more resistance units connected to the mounting element, each resistance unit having at

least one cord attached thereto at a first end of the cord, and an engagement interface at a second end of each cord; and at least one cord-positioning structure comprising a shaft having a point of attachment to the mounting element and having one or more cord guides connected thereto. Each cord-positioning structure is adapted to provide the one or more cord guides in a position located rearward of the user, downward relative to a waist level of the user, and, optionally, outward relative to a spine of the user. The engagement interface is adapted to engage or be engaged by an arm or hand of the user and the resistance unit is mounted on the mounting unit, or the resistance unit is adapted to engage or be engaged by an arm or hand of the user and the engagement interface is mounted to the mounting unit, the cord-positioning structure, or one of the guides. The method further comprises wearably securing the device to the user; engaging the engagement interface or the resistance unit via the arm or hand of the user; and swinging the user's arms in a natural swinging motion in which resistance to swinging motion is provided by the resistance units over a full forward arm swing of the user. The methods may be performed indoors or outdoors, with or without additional exercise equipment.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a schematic illustration showing a rear view of an exemplary exercise device comprising two resistance reels with cords attached, using a single cord-positioning structure, in accordance with one embodiment of this invention.

FIG. **2** is a schematic illustration showing a rear view of an exemplary exercise device comprising two resistance reels with cords attached, using two cord-positioning structures, in accordance with one embodiment of this invention.

FIG. **3** is a schematic illustration showing an exemplary device having a single resistance reel, in accordance with one embodiment of the invention.

FIG. **4** is a rear view of a person wearing the device shown in FIG. **1**.

FIG. **5** is a top view of a person wearing the device shown in FIG. **1**.

FIG. **6** is a right side view of a person wearing the device shown in FIG. **1**.

FIG. **7** is a right side view of a person wearing an exemplary exercise device employing reels mounted on the person's arms, in accordance with one embodiment

of this invention.

FIG. **8** is a right side view of a person wearing an exercise device allowing up and down adjustment, in accordance with one embodiment of this invention.

FIG. **9** is a schematic of a cord-positioning structure with adjustable width and length, in accordance with one embodiment of this invention.

DETAILED DESCRIPTION OF THE INVENTION

The invention will next be illustrated with reference to the figures, wherein the same numbers indicate the same elements in all figures. Such figures are intended to be illustrative rather than limiting and are included herewith to facilitate the explanation of the present invention. The figures are not to scale, and not intended as engineering drawings.

Referring now to FIG. **1**, there is shown exercise device **10** comprising a mounting element **11**, which may comprise a belt (as shown in Fig. 1), a vest, a halter, a jacket (not shown), or a combination thereof, having a pouch **12** with a height of about 4 to about 6 inches. It may be desirable for the belt or other mounting element to comprise a lightweight, comfortable material of construction. The pouch encloses a mounting base **13** upon which are mounted left and right resistance reels **14a** and **14b**. Although resistance reels are shown, other types of resistance unit may be used. Resistance units may for instance operate through use of friction, dashpot(s), spring(s), elastic material(s), or any other conventional means. Frictional resistance reels of the types disclosed in U.S. Pat. No. 5,618,249 to Marshall and in U.S, Pat. Appl. No. 10/033,108, filed Dec. 28, 2001, and in U.S. Provisional Patent Application No. 60/463,534, filed on April 17, 2003, by the common inventor of this invention, all of which incorporated herein by reference, are particularly suitable for use with the present invention. Although mounting in a belt is shown in Fig. 1, the reels may in general be mounted on or in a belt, vest, halter, jacket, or any manner which provides similar functionality. The resistance devices may be mounted permanently or may be removable, such as with a clip-on mounting. Mounting base **13** may be attached to pouch **12**, and may be of any convenient size, shape, and material of construction sufficient to firmly anchor the resistance wheels and cord-positioning structure **18**. Although shown enclosed in a pouch in FIG. **1**, in other embodiments the reels and mounting base may be exposed. The reels are shown in Fig. **1** mounted in the rear of

the device, but the positioning is not critical. For example, in another embodiment discussed herein later, the reels may be mounted on the hands or arms of the user.

Engaging the resistance reels are left and right cords **16a** and **16b**, which pass through cord-positioning structure **18** and terminate in left and right user engagement interface **28a** and **28b**. Although the cord may preferably be a plastic-coated, twisted-metal cable as is well known in the art, the term "cord" as used herein is used generically to refer to any type of cable, line, cord, band, strip, rope, chain, string, or other means known in the art suitable for transmitting tensile resistance to the arm movement of the user from resistance reels **14a** and **14b**. The cord may be non-elastic or may have some elasticity.

The user engagement interface may be of any conventional shape, for instance flared grips or padded loops. The engagement interface may comprise any of the suitable mechanisms known in the art for enabling engagement by or attachment to a portion of the upper body, however, such as but not limited to handles, grips, bars, wraps, gloves, straps, cuffs, and the like. The user engagement interface may be permanently attached to or detachable from cord **16a** or **16b**. For an upper body user engagement interface, the interface may be designed to be attached to, engaged by, or held by any portion of the arms, wrists, hands, or fingers of the user. The user engagement interface may be securable to the arm or hands by any mechanism known in the art, such as but not limited to the user grasping or holding the interface, or the interface being secured to the user by any type of fastener such as one or more buckles, Velcro® fasteners, snaps, pressure fittings, hooks, loops, clips, and the like. The user engagement interface can be padded for comfort, and/or lined for sweat absorption. Open-handed grips, such as loops, gloves, straps or cuffs, and loose grips, such as flared grips that transfer force to the top of the user's hand at the user's thumb and forefinger rather than requiring a tight grip, are particularly desirable.

In the embodiment shown in FIG. **1**, a single cord-positioning structure **18** is attached to base **13** at point of attachment **20**, which may optionally comprise a hinge, and comprises a shaft **22** having a length L, a crosspiece **24** having a width W, and left and right cord guides **26a** and **26b** each comprising a pulley attached to an end of crosspiece **24**. Although shown in FIG. **1** with each pulley-type guide **26a** attached at the end of a chain **25** secured to crosspiece **24**, the cord guides may be attached directly to crosspiece **24**. Shaft **22** and crosspiece **24** may be solid, but are

typically hollow, for purposes of weight reduction. Cords **16a** and **16b** wrap around the reels, and pass though the pulleys. In the case where shaft **22** and crosspiece **24** are hollow, the cords may pass through them, as shown in FIG. **1**. Although pulleys are shown, the cord guides may be simple rings, eyelets, or other guide devices known in the art, or may merely be the open ends of crosspiece **24** in embodiments where **24** is hollow. For non-pulley embodiments, the cord-guides and cords may have a low-friction coating or composition to provide smooth operation. The cords may be about 55 to about 90 inches in length, but any length long enough to properly engage the resistance units and afford a full range of motion is acceptable.

Crosspiece **24** is shown as a straight piece, but may comprise one or more straight or curved sections. Shaft **22** and crosspiece **24** may each separately comprise a rigid, unbendable material, or may have one or more resilient portions to allow them to bend and then return to their original shape as force is applied and then relieved. Or, the shaft may be rigid over most of its length but comprise a resilient portion at or near point of attachment **20**, to allow bending to one side and subsequent recovery.

FIG. **2** shows an alternative embodiment of the invention in which two cord-positioning structures **18a** and **18b** are used to position the cords. The structures comprise pulleys **26a** and **26b** attached to shafts **22a** and **22b**, which may or may not be hollow, and which are attached to base **13** at points of attachment **20a** and **20b**. Cords **16a** and **16b** wrap around reels **14a** and **14b**, pass through pulleys **26a** and **26b**, and attach to user engagement interface **28a** and **28b**. Dual reel embodiments of the type shown in FIG. **1** and **2** allow independent motion of the arms, which may in some cases be advantageous, and may more easily afford a means of retracting both left and right cords onto the reels when the exercise device is stored.

FIG. **3** shows another embodiment of the invention in which a single resistance reel **14'** is mounted on base **13**, and in which **14'** engages both cords **16a** and **16b**, which may optionally comprise a single cord. The advantages of a single reel embodiment include the simplicity of design and the economic benefit of having only a single reel and cable. Although shown with a single cord-positioning structure, a single-reel embodiment may instead employ two cord-positioning structures. Furthermore, single reel embodiments can provide only the same resistance for each arm, and the cable is not fully retractable when in use. The choice of a single vs. dual

reel configuration will thus depend upon individual needs.

FIG. **4** shows the device of FIG. **1** being worn and used by a person **30**, with the belt being at approximately waist level. The figure shows a part of the gait cycle in which right arm **32b** is pulling cord **16b** forward in direction F against a resistance provided by right reel **14b**. The resistance may or may not be adjustable, and may be within a range of about 0.5 to about 10 pounds, preferably between about 1 and about 5 pounds. Relatively low range resistance is particularly desirable for high-repetition, aerobic exercise as well as for warm-up / cooldown exercising, stretching, toning, and shaping. Simultaneously, left arm **32a** swings in direction R, while cord **16a** is retracted onto left reel **14a** via a retracting force.

The retracting force may be provided by any conventional means, for instance a spring or elastic material, which may be incorporated in the reel. Alternatively, a weight or a motor may supply the force. The force may be enough to retract the cord while providing minimal rearward pull to the user's arm, or may be high enough to provide substantial resistance, thereby increasing the effort level of the workout. If a single resistance reel is used, as in FIG. **3**, the retracting force may be provided by the arm that is pulling the other cord forward. Cord guides **26a** and **26b** are located behind the person, below waist level, and sufficiently outward relative to the interline **33** coincident with the spine of the user to allow a natural arm swing by the user.

FIG. **5** is a top view of the invention and person of FIG. **4**, showing the same portion of the gait cycle. Shaft length **L** and crosspiece width **W** are such that they allow a natural range of motion for both arms when the arms swing forward in direction **F** and rearward in direction R during walking. Length **L** is preferably between about 6 inches and about 12 inches, most preferably about 10 inches, and width W is preferably between about 8 inches and about 12 inches, most preferably about 10 inches.

FIG. **6** is a right side view of the invention and person of FIG. **3**, showing the same portion of the gait cycle. Shaft **22** is tilted downward, allowing left arm **32a** to effect a full range of motion downward and rearward at the end of the swing in rearward direction R with substantially full extension, with lift hand **34a** ending its swing below waist level.

FIG. **7** shows an embodiment of the invention in which reels **14a** and **14b** are

mounted on the users arms **32a** and **32b**, and cords **16a** and **16b** are wound around reels **14a** and **14b** and attached to or guided through cord guides **26a** (not in view) and **26b**. The reels may be attached in any convenient location on the arms or hands by means known in the art, advantageously on or near the lower part of the arms. The cords may be attached directly to cord guides **26a** and **26b**, or may travel through the guides to attachment points on mounting element **11** or anywhere on the cord-positioning structure.

FIG. **8** shows an embodiment of the invention in which point of attachment **20** comprises a pivotably adjustable, positionally lockable member connecting shaft **22** to base **13**, allowing adjustment of the shaft to a position **B** that forms an angle α relative to position **A** (dashed lines) parallel to the ground, allowing the user to suit individual preferences. Point of attachment **20** may comprise a ball-and-socket assembly allowing both up-down and left-right adjustability, which may be particularly suitable for the embodiment shown in FIG. **1B**, or may allow only up-down adjustment. Angle α may be approximately 45 degrees, but the exact value is not critical. The adjustment across angle α may be continuous or may have a series of discrete intermediate stop points. The shaft **22** may also be adjustable to a vertical position **C** (dashed lines) for storage. The vertical orientation may be pointing up as shown, or pointing down.

All of the embodiments shown and described herein have as a common feature, cord-positioning devices that allows the user to engage the resistance mechanism over the user's full natural arm swing. The cord-positioning devices provide the cord guides (or attachment points for the cords in some embodiments where the resistance devices are mounted on the user's arm) at a position located rearward and downward relative to the user's waist, and preferably outward relative to the user's spine. The location outward relative to the user's spine is preferable to prevent rubbing of the cord against the user's waist as the cord is extended forward during the upswing. The outward location also provide a force vector of resistance that is more close to parallel with the arm swing, thereby providing a larger component of resistance to the arm swing as compared to embodiments in which the cord guide is not positioned outward relative to the user's spine. This difference in the component of resistance parallel to the arm swing is particularly significant when the arm is at the beginning of the upswing. Despite the advantages of being able to position the cord guides outwardly relative to the user's spine, embodiments without such a capability are still functional.

Because of the desirability of maximizing the workout by providing resistance over the full, natural arm swing, the rearward, downward, and/or outward position may be adjustable to fit individual users. In addition to or as an alternative to the pivotable adjustment at the point of attachment as described above, the cord-positioning structures may be adjustable in other ways as well. For example, the length L and width W of cord-positioning structure **22** shown in Fig. **1** may be adjustable, as illustrated in the exploded view shown in FIG. **9**.

As shown in FIG. **9**, cord-positioning structure **118** comprises a two-piece shaft **122** having a female component **122a** and a male component **122b**. Female component **122a** has a number of axially spaced holes **121**, and male component **122b** has at least one radially compressible pin **123** capable of being pushed into a position that does not radially protrude from the circumference of male component **122b** for insertion of the male component into female component **122a**. When aligned with any one of the axially spaced holes **121**, however, pin **123** resiliently returns to a position that protrudes through hole **121** and fixes the male and female components in a coupled position, as such resilient-pin-and-hole devices are commonly employed in the art. In this way, the overall length L may be adjusted by the user by choosing through which hole **121** pin **123** should be allowed to protrude. It should be understood that although shown with a single pin and set of axially aligned holes, for added stability, components **122a** and **122b** may comprise multiple pins for fitting with multiple sets of axially aligned holes. Also, it should be understood that the component in the position of **122a** may be the male component and the component in the position of **122b** may be the female component.

Another adjustment mechanism is shown with respect to crosspiece **124**. Crosspiece **124** may comprise two female threaded ends **125a** and **125b**, designed for coupling with male threaded ends **126a** and **126b**, respectively. Thus, by choosing how far to screw male threaded ends **126a** and **126b** into female threaded ends **125a** and **125b**, the user can adjust the overall width W.

Although exemplary cord-positioning structure **118** is shown in FIG. **9** with a pin and hole type adjustment mechanism for the shaft and a screw-type adjustment mechanism for the cross-piece as an illustrative example, it should be understood that any type of adjustment mechanism known in the art may be used for any part of the cord-positioning structure. Similarly, any type of adjustment mechanism may be used

analogously with respect to dual cord-positioning structures, such as structures **18a** and **18b** as shown in FIG. **2**.

The subject invention solves a number of the problems associated with existing machines in one simple, compact, economic, easy-to-use mechanism. The placement of the mechanism behind the user allows for a more natural arm motion and promotes a more natural, upright body position, which is more comfortable for the user. As compared to stationary pole-type mechanisms on stationary equipment, the present invention provides a more flexible and versatile range of motion, allowing the user to choose the amount of upswing and back swing distance most comfortable for him or her and to choose the most comfortable plane of motion relative to body. A full range of motion is available, affording more exercise in less time, and more flexibility. Moreover, the invention is not fixed on any particular stationary equipment and thus may be used with or without other exercise equipment, may be used indoors or outdoors, and may be used while either running or walking. Use while walking, in particular, reduces the chances of potentially injurious foot impact, while maintaining a high level of resistance, and hence exercise, as desired.

The arm exercise mechanisms discussed herein are relatively inexpensive to manufacture and are relatively easy and inexpensive to repair or replace. The mechanisms discussed herein are also lightweight and are compact for storage.

Although various embodiments of the invention have been described, it will be understood that the invention is not limited to these embodiments, but is capable of numerous modifications of parts, elements and materials without departing from the invention.